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Lovely Little Angels in Heaven? The Influence of Religiously Determined Cultural Life Scripts on Infant Survival in the Netherlands, 1880-1920

Angélique Janssens & Ben Pelzer*

Abstract: »Kleine Engel im Himmel? Der Einfluss religiös geprägter Lebensskripte auf das Überleben von Säuglingen in den Niederlanden, 1880-1920«. The way small infants are cared for, in the past as much as today, is partly determined by cultural scripts which may vary between places and times. In the past some of the cultural scripts involved in infant care were shaped by religious rules and traditions. These scripts could sometimes be life-saving, as was the case with the orthodox Jewish care of infants, or they could be lethal, given the circumstances. In Dutch historiography, the Catholic community has been held responsible for the rather high level of infant mortality during the later parts of the nineteenth century and the early decades of the twentieth century. From this perspective Catholics are either seen as having been averse to the introduction of modern medicine and hygiene, or as followers of a strict clerical campaign of prudishness enforcing the binding of female breasts and prohibiting the bearing of breasts in public. As a result Catholic mothers did not or could not suckle their infants, thereby creating life threatening situations for their little ones. In this study we first explore the likelihood that Catholic mothers were not breastfeeding their infants; secondly, we test the role of religion as the most important exogenous determinant of infant mortality in the period 1880-1920.

Keywords: Infant mortality, Catholics, breastfeeding, regional cultures.

1. Introduction

In the past the first and most important life event – being born – was also the most dangerous one. Many infants did not survive this event and a large proportion perished at some stage during the first months following birth. Death in infancy is a complex phenomenon determined by a complicated and interrelated mix of biological, economic, social and cultural influences. One of these

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cultural influences is the type and the quality of care given to infants by parents and other care-givers. The way small infants are treated and cared for, in the past as much as today, is partly determined by cultural scripts which may vary between places and times. For instance, today the age-old tradition of the swaddling of babies is again springing up in the Netherlands. Also between generations the preference to put babies to sleep on the belly or on the back has changed many times. In the past some of the cultural scripts involved in infant care were shaped by religious rules and traditions. These scripts could sometimes be life-saving, as was the case with the orthodox Jewish treatment and care of infants, or they could be lethal, given the circumstances. In Dutch historiography, the Catholic community has been held responsible for the rather high level of infant mortality which persisted in this country at the end of the nineteenth century until the early decades of the twentieth century. At a time when most other groups in the Dutch population were successfully and strongly increasing the proportion of infants surviving until their first birthday, Dutch Catholics were still suffering high rates of infant loss. Early twentieth-century contemporaries accused the Catholics, especially the southern ones, of being quite fatalistic about the loss of their little ones; it was said that Catholics regarded their dead infants as ‘lovely little angels in heaven’ who would ‘pray for them’ (Heijden 1934, 116).

In Dutch historiography the persistence of high rates of infant mortality amongst Catholics are mostly attributed to two factors, which although different may also be perceived as in some way related. First of all, most authors have portrayed Dutch Catholics as taking up a strongly anti-modernist stance in the period between the 1870s and the 1920s, resisting modern ideas and practices regarding hygiene and medical intervention. Secondly, some authors have pointed towards the existence in this period of a culture of extreme prudishness and sexual and physical shame initiated and enforced by the Catholic clergy, especially in the south of the country. An important part of this culture of prudishness was the ban issued by the church on the bearing of breasts in public, which resulted, according to the assumption of some authors, in Catholic mothers discontinuing the suckling of their babies. By doing so Catholic mothers in this period are believed to have exposed their infants to life threatening dangers. In this article we will first of all determine whether Catholic mothers at the beginning of the twentieth century, as opposed to mothers in other denominational groups, were likely to have denied their infants the mother breast. Secondly, we will examine whether infant mortality levels were indeed higher for Catholic women in different parts of the Netherlands. In this paper we use individual and family level data taken from Dutch population registers to examine the effects of religion on infant mortality.

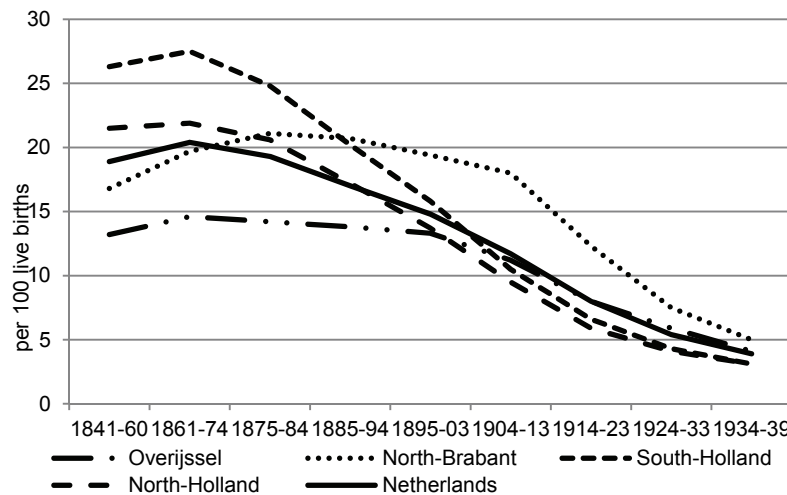
2. The Historiographical Record on Infant Mortality

As was the case in other European countries, the Netherlands went through a process of declining mortality in the second half of the nineteenth century. Overall mortality in the Netherlands began to decline from 1855 onwards, first slowly, and then from 1880 a more rapid decline set in. The strongest decline however occurred in the period between 1917 and 1955 (Wolleswinkel-van den Bosch et al. 1998). Obviously, death rates amongst infants in the nineteenth century and the beginning of the twentieth century contributed in significant ways to overall mortality and hence to its decline. Nevertheless, the development of mortality risks amongst infants followed its own rather divergent course. In the period between 1840 and 1889 infant mortality rates in the Netherlands were on the rise, although a large degree of variation existed between regions (Poppel and Mandemakers 2002). The regional variation over time within the Netherlands moreover presents an intriguing and sometimes puzzling picture. Until the early 1890s infant mortality was lowest in the northern and eastern parts of the country and highest in the western and south-western parts of the country, although in the latter area rates began to decline somewhat from the 1860s onwards. By the 1900s the infant mortality map of the Netherlands changed to a clear north-south division with high rates in the southern provinces and low rates in the north (Ekamper and Poppel 2008).

The regional development over time in infant mortality is visible in figure 1; here provinces are represented which are relevant for the purposes pursued in this paper. Between 1841 and the opening decade of the twentieth century the eastern province of Overijssel was characterised by infant mortality rates which were quite low in a comparative sense, but from 1904-1913 onwards this eastern province should be located in the rearguard, with rates eventually rising to a level above the national average. The opposite picture can be seen in the development for the province of South-Holland, located in the south-western part of the country. Here mortality risks for infants were extremely high, but after the 1860s-1870s infant mortality rates began its steep decline, accelerating in the 1880s, towards a level well below the national average after the 1900s. The north-western province of North-Holland on the other hand is positioned between the clear north-east and south-west division found in the middle of the nineteenth century, with rates above the national average but below the south-western province of South-Holland. Here also, infant mortality declines strongly after the 1870s, so that after the turn of the century this province is one of the least dangerous areas of the country for small infants. Quite a different story can be told concerning the province of North-Brabant, situated in the south of the country. Initially, in the middle of the nineteenth century, infant mortality rates in this province were moderate and below the national average; however, instead of declining towards the end of the century, rates began to climb up-

wards. From the 1880s onwards until the early 1920s the province of North-Brabant was the most dangerous place in the country for a baby to be born.

Figure 1: Infant Mortality Rates in Selected Provinces of the Netherlands, 1841-1939



Source: Ekamper and Poppel 2008.

Studies searching for explanations for the large regional differentials in infant mortality, and its changes over time, have in the first place revealed that regional differences are not dependent upon and determined by socio-economic differences. Despite the existence of social class differentials in infant mortality within provinces, the wider regional environment was much more important than social class for an infant's chances at survival during its first year of life. These regional differences should also not be read as rural-urban differences; these appeared irrelevant for infant survival in the period between 1812 and 1909 (Poppel, Jonker and Mandemakers 2005). Most authors have argued that religious differences were the primary factor in determining infant mortality levels, with Catholics having had much higher levels of infant mortality than Protestants or other denominational groups. These religious differences, which became more pronounced by the final quarter of the nineteenth century, helped shape the regional pattern as the southern part of the country, e.g. the province of North-Brabant, was predominantly Catholic whilst Protestants were mainly found elsewhere.

Why would Catholic families in the Netherlands have had higher death tolls for their very young than Protestant families? A number of factors are listed in the literature (Engelen 2009). First of all, marital fertility amongst Catholics

was considerably higher than amongst Protestants. Hence, birth intervals in Catholic families tended to be short which is generally an important determinant for infant survival; also higher birth-order children tend to have higher mortality risks. Moreover, with increasing family size mothers would not be able to maintain high levels of child care. Furthermore, Catholics in the Netherlands are seen as having been averse to new insights and practices from modern medicine and modern hygiene (Philips 1980; Wolleswinkel-van den Bosch et al. 2001). In this perspective Catholics are seen as anti-modernists, lacking a critical and rational mentality, and thereby creating a strong cultural rigidity in the pattern of high mortality risks in the southern parts of the Netherlands. Protestants on the other hand are placed in the opposite role of open-minded, early innovators with regard to demographic behaviour, both in terms of fertility and mortality. Some however leave room for doubt in establishing the religious factor as the main determinant of regional differentials in mortality. Frans van Poppel for instance suggests that other closely related factors may be at work and that a true test of the role of religious factors can only be done on the basis of studies using individual-level data from different regions (Poppel 1992).

A final line of reasoning linking Catholics causally to higher levels of infant mortality in the Netherlands focuses on the issue of breastfeeding. It is assumed that mothers in the Catholic areas of the south and the south-east in the final decades of the nineteenth century stopped breastfeeding their infants altogether, or soon after birth, to change over to the dangerous practice of bottle or porridge feeding, thereby exposing their infants to a greater risk of digestive diseases. Considerable evidence testifies to the strong link between the absence of breastfeeding or early weaning and high infant mortality risks in the nineteenth and early twentieth century. The assumption that Catholic mothers in the southern parts of the Netherlands stopped breastfeeding in the final decades of the nineteenth century has given rise to sometimes heated debates as to the reason why this was the case. The most controversial position was taken up by Meurkens (1984) who argued that in the 1880s, the Catholic clergy in the province of North-Brabant initiated a culture of prudishness, urging women to refrain from bearing parts of their body, except for hands and face, at all times. Suckling mothers were obviously greatly affected by this clerical campaign and were encouraged to switch to artificial feeding. In recent years the strongest evidence against this position was produced by Walhout (2010) on the basis of a detailed analysis of cause of death patterns for all communities in the province of North-Brabant. Walhout found that the increases in the 1880s of infant mortality due to diseases of the digestive system occurred not only in Catholic communities but that the increase was even stronger in non-Catholic communities in this province than in the Catholic ones. Therefore, according to Walhout, non-Catholic mothers stopped breastfeeding their infants even more so than Catholic mothers.

Micro-studies using individual level data have not always been able to find evidence for the assumed connection between Catholicism and enhanced mortality risks for infants in the nineteenth and early twentieth century. Janssens et al. (2010), in their study on gendered mortality patterns amongst infants and children, demonstrated that children in Protestant families in an eastern area of the country had an even higher propensity to die than Catholic children; however, this effect was no longer significant when various types of family variables were being controlled for, such as birth order, or the death of parents or siblings. The authors concluded that the fate of young children was decided more by the demographic and biological make-up of the family than by other socio-economic or cultural characteristics. Van Poppel et al. (2002) however did find evidence that Catholic infants in the western town of The Hague were running greater mortality risks than infants in other denominational groups. Their analysis however included only few family-based demographic and biological characteristics.

In this paper we will explore the role of religion in infant mortality in the first decades of the twentieth century in four towns situated in different areas of the country: Tilburg, Enschede, Rotterdam and Zaandam. Figure 2 shows the map of the Netherlands and how these towns are situated in the country. For these four towns we will conduct a multivariate analysis to test the importance of the variable religion in the mortality risks of infants for a cohort of mothers born in 1881-1885. These mothers were having their children in the period following the turn of the century up to and including the early 1920s. We will also explore the importance of the regional factor to test whether infant survival chances, independent from religion, were better in the northern and western part of the country, which is deemed to have been more advanced in terms of the adoption of modern medical and hygienic practices, than the southern and eastern parts. However, we will start with the issue of breastfeeding which can be seen as a proxy for the adoption and the use of modern practices of infant care in this period. For each of the four locations and for the two major denominational groups, the Catholics and the Dutch-Reformed (the largest Protestant community in the Netherlands), we will investigate the length of birth intervals by survival status of the previous child. This technique provides an important indication, albeit indirectly, of the likelihood that mothers were breastfeeding their infants. Before we embark upon these analyses we will briefly discuss the four study towns, as well as the nature of the data and the sources used.

Figure 2: Map of the Netherlands



Cartography: Peter Ekamper (NIDI).

3. The Four Study Locations, Data and Sources

As can be seen in the map of the Netherlands the four towns are situated in quite different parts of the Netherlands: Rotterdam and Zaandam in respectively the western and the northern part of the country, and Enschede and Tilburg in the eastern and southern part. The four towns are located around the south-west to north-east diagonal line along which the process of demographic modernization in the Netherlands took place. Whilst the southern and south-eastern provinces of the Netherlands were still characterised by rather traditional marital and reproductive patterns around the turn of the twentieth century, families in the north-western provinces had already started off on their long road towards more modern demographic practices. This will allow us to test whether

the receptiveness towards modern reproductive attitudes also translates itself into more modern behaviours regarding the care of infants.

The four cities also represent different positions along the economic spectrum of the country. By the early 1880s Enschede and Tilburg, in the east and south, had become bustling industrial towns fully focused on the production of cotton and woollen cloth respectively. Both towns had emerged as major industrial centres in a country that was otherwise only slowly embarking on the path to modern industrial development (Horlings 2001). In Enschede and Tilburg, however, the majority of both male and female workers were found to be working in the textile mills at the end of the nineteenth and the beginning of the twentieth century. The pace of industrialization in Enschede however was much faster than in Tilburg in which latter town cottage-weaving, mainly by male workers, continued to be of importance until the end of the nineteenth century (Groot 2001). Moreover, in Tilburg employers were reluctant to hire women for work within their factories, and continued to employ girls and married women at home. Both cities were medium sized in terms of population: in 1890 Tilburg counted over 34,000 inhabitants and for Enschede this figure was more than 23,000.

Rotterdam and Zaandam were rather different in their economic structure; they were both different from each other but also different from Enschede and Tilburg. In the period under consideration here Rotterdam, already quite large by Dutch standards in 1890 with a population of more than 200,000 inhabitants, had grown into a major commercial centre and port town. Many occupations in the city were categorised within the 'trade and financial service' sector, and most industrial jobs were closely tied to the town's shipping activities, such as those in steel works and shipbuilding (Laar 2000), so that the Rotterdam labour market was primarily a male one. Zaandam, the smallest of the four cities with a population of over 15,000 inhabitants in 1890, could boast a long industrial tradition by the end of the nineteenth century because of its close ties to the regional economic system of the market for staples in Amsterdam dating from the seventeenth century. In 1899 nearly half of the town's male workforce was found in industrial jobs in the metal- and ship-yards, in the food and chemical industries, and in wood processing.¹ The Zaandam workforce consisted predominantly of male workers, fewer than 1 in 5 of the town's women was gainfully employed in 1899.

In addition the four cities represent different positions along the complex religious spectrum of the Netherlands in the study period. This spectrum reflects the fact that the Netherlands was at one time situated on the fault line between Rome and the Reformation. At the end of the nineteenth century Enschede and Rotterdam were broadly similar in their religious make-up; both cities had a

¹ CBS, *Statline*, figures derived from the occupational censuses of 1899.

majority of their population adhering to the Dutch-Reformed Church and a further quarter belonging to the Roman Catholic Church.² A small segment of the population in these two cities followed either the Calvinist faith, which is the orthodox version of Protestantism, or belonged to yet another church. Zaandam and Tilburg represent completely different images; Tilburg, as was the case in nearly all towns in the south, was completely dominated by the Roman Catholic Church. Zaandam, on the other hand, was already quite a liberal and non-conformist community at that time, with a small, but not negligible, 15 per cent of all inhabitants declaring that they did not belong to any church. In addition, an important group in Zaandam, was formed by adherents to the most liberal versions of Protestantism, such as the Anabaptists (called *Doopsgezinden*).

For each of the four towns we have used data on a cohort of women born in the period 1881-1885. This dataset was compiled in the context of a study into the demographic behaviour of Dutch women in the period 1880-1960.³ Data collection was done in cooperation with, and according to the format of, the *Historical Sample of the Netherlands* (HSN), a national databank containing approximately 78,000 individual life courses drawn from amongst the Dutch population in the nineteenth and the twentieth century.⁴ For this paper we are using one of the two non-selective samples that were drawn from the birth registers of each of the four towns under study, namely the one consisting of a cohort of girls born in 1881-1885. This cohort consists of girls who survived until their 15th birthday and beyond; however for the analysis presented here we are only using those women who proceeded towards marriage and motherhood, defined as having had at least one child within marriage.

The life course data for these women were taken from the Population Registers and the Civil Registers of the four towns. Continuous Population Registers have existed in the Netherlands from 1849 onwards. The population registers enable the historian to follow the evolution of the family and the household on a day-to-day basis.⁵ The registers thus present information on demographic events in an already linked format on the entire population, even the very mobile, and it facilitates the computation of a wide range of demographic rates. All women were followed through the Population Registers until they disappeared from observation. For all women the entire life course was reconstructed, including all information on their demographic, household and occupational

² Derived from the censuses of 1899, see <www.volkstellingen.nl>.

³ The results of this project will be presented in a book titled: *Labouring lives. Women, work and family formation in the Netherlands, 1880-1920*. The book is currently in press with Peter Lang Publishers, Geneva.

⁴ Historical Sample of the Netherlands (HSN). Name of the project: *Regional differences demographic behaviour Netherlands 1900-1960* (RDN), release RDN 97.1, 99.1 and 02.1. For more information about the HSN, see <www.iisg.nl/hsn>.

⁵ For an introduction into the contents and the use of Dutch Population Registers see Janssens (1993, 50-68).

careers. In addition, information was gathered on all members of the households in which the cohort women had lived during their lives, so that we have information on their husbands and all children born to them. The mortality data are analysed with the help of event history analysis techniques, which label covers a collection of statistical procedures which make possible complex multivariate analysis of duration data. The risk of dying for infants below age one is then analysed, whereby the effect of various independent variables is examined. Of prime interest here are the variables for location and religion. Various other relevant variables, such as the father's social class will be taken into account as well, and in addition we will be controlling for a number of demographic variables such as age of the mother, the length of the birth interval, the death of either of the parents, or the death of older siblings. However we will also be using these data to investigate the length of birth intervals of the women in this cohort to gauge the likelihood that women were breastfeeding their infants. In the next section we will discuss these results after having discussed the issue of Catholics and breastfeeding.

4. Infant Care: The Issue of Breastfeeding

There can be little doubt that nineteenth- and early twentieth-century infant mortality rates in most European countries were closely related to the adoption by mothers of breastfeeding practices. The extent to which European mothers were suckling their own babies seems to have varied greatly between times and between regions, nevertheless the suggestion has been advanced that the primary distinction in infant feeding practices in the European past should be drawn between the northern and the southern parts of the continent. Northern-European women were more likely to be breastfeeding their own babies whilst women in southern-European countries were more likely to be employing wet-nurses or artificial foodstuffs to feed their babies. This distinction, it is argued, is related to cultural differences between predominantly Catholic and Protestant areas, as well as to the influence of aristocratic child care traditions (Thorvaldsen 2008). As to how we should view the mechanism of this link between cultural differences in baby care and religious orientation remains vague. Thorvaldsen (2008) suggests that we may be looking at long-term cultural traits which can be traced back to differences between the Germanic and Roman cultures.

It is difficult to see how church doctrines may create differences in the acceptance of breastfeeding practices. In attempts to formulate theoretical links between religious orientation and health some authors have gone back to the classical analysis of the Protestant work ethic by Max Weber. According to Weber, the Protestant work ethics created a life style characterised by self-discipline, moderation and rationality. Protestants were taught to respect life,

which was seen as God's creation, and to avoid temptation and the improper attachment to worldly things. This particular outlook on life and the world promoted health-advancing actions amongst Protestants and an open attitude towards the insights produced by modern medical science in the later parts of the nineteenth century (Poppel 1992). Throughout the nineteenth century right through to the early decades of the twentieth century medical reformers have vigorously attempted to promote breastfeeding for infants. If the Weberian line of thinking should be correct, Catholic circles were less receptive to these urgent medical calls and admonitions.

Whatever the precise connection is between religious denomination, breastfeeding practices and infant mortality, there is quite some evidence from various places and times suggesting that Protestants and Catholics do differ in infant feeding practices, as well as infant death rates. Based on family genealogies from two German parishes extending over the seventeenth until the twentieth centuries, Kemkes-Grottenthaler (2003) found evidence for more elongated breastfeeding duration amongst Lutheran families as compared to Catholic families. Her evidence is based on the timing of infant deaths: under conditions of prolonged breastfeeding, infant mortality will rise in the later months of the first year of life whilst the reverse pattern will be visible when babies are not commonly given mother's milk or only for a very brief period. The German data for Lutheran and Catholic babies appeared to fit this assumption quite well.

For the Netherlands, Van Poppel et al. (2002) in their study of families in the town of The Hague have also attempted to get at breastfeeding practices via indirect quantitative methods by looking at the seasonality of infant deaths. Here the assumption is that a lack of suckling will lead to a higher incidence of infant deaths in the summer months due to gastric diseases; given poor hygienic circumstances and the effect of high temperatures on the quality of milk or other foodstuffs, infants who were not breastfed were most vulnerable during this season. Differences between Catholics and Protestants were indeed considerable; in both groups postneonatal mortality in summer was highest, but much more so amongst Catholics than amongst Protestants. Similarly, a study conducted in Tilburg into nineteenth-century infant mortality showed that infant mortality peaked during the summer months, and was connected to digestive disorders; this is believed to be a clear sign of a lack of breastfeeding (Heijden 1995). To what extent seasonal mortality patterns in Tilburg differed between Catholics and Protestants was not investigated however. Also for nineteenth-century Paris the seasonality effect has been found: during July and August infant mortality was high, but for bottled-fed infants it was as much as eight times higher than for breastfed infants (Pollet 1997).

There is ample evidence that during the greater part of the nineteenth century in various European countries authorities were complaining about the unwillingness or reluctance of mothers to suckle their babies. Some have even

attempted to regulate mothers' feeding behaviour by law; for instance in the Netherlands, Louis Napoléon Bonaparte, who was made king of Holland in 1806 by his brother the French emperor, issued a decree in 1809 in which mothers were urged to breastfeed their infants (Engelen 2009). In the second half of the nineteenth century German physicians and other social reformers were publicly playing upon German women's consciousness; one of them for instance stated that "there is lack of motherly love which reveals itself only in the breast-feeding mother." Mothers were clearly to blame for the high death toll amongst their infants, because, according to these physicians, they were following foolish habits and displaying superstitious attitudes in infant care (Müller and Schraut 2007). Other examples can be found for other parts of Europe, some even dating back to the eighteenth century (Thorvaldsen 2008).

Also in the Netherlands from the mid-nineteenth century onwards, physicians were trying to get mothers to suckle their infants, and blaming them if they did not follow these advices (Eekelen 1984). Some authors singled out Catholic mothers in particular, such as the physician P. J. M. Aalberse who in 1917 stated that

there are Catholic districts in our country where I am aware that it is particularly the Catholics who do not breast-feed because of a misplaced sense of shame or, even worse, because of the tradition of binding young girls' breasts, so they won't develop so that these women are systematically being made unable, in their youth, to feed their own babies. In these districts it is possible to physically see whether a woman is Catholic or Protestant. This terrible habit is probably the result of prudishness which is wrongly equated with morality (Poppel 1992; Heijden 1934).

Other medical practitioners however were convinced that mothers in the Catholic southern province of North-Brabant were simply ignorant of the most basic principles of modern baby care. As late as the 1920s quite some mothers in this province, so they stated, were still unaware that infants needed to be washed regularly, that they needed light and fresh air, that advice should be sought timely, and preferably from medical experts rather than from equally ignorant neighbours, etcetera (Heijden 1934). These observers also reported that social control was considerable on the mothers to strictly follow old traditions in the care of infants rather than listen to modern advice (Barentsen 1935, 231). Hofstee (1983) has tried to assess the degree to which mothers across the Netherlands were actually breastfeeding their infants from the middle of the nineteenth century until the end of that century. Qualitative evidence, he had to admit, was scanty and his crude quantitative exercises based on provincial averages for marital fertility led him nowhere near a solution of this issue.

In the remainder of this section we will attempt to say something about the likelihood to which women in the four different study locations were actually breastfeeding their infants. We will do so by looking at indirect evidence, based on the length of birth intervals for the dataset of mothers with at least one child in the four towns. If these women were breastfeeding their babies, they were

likely to have longer birth intervals than mothers who were not suckling or who were suckling for only a very brief period. Breastfeeding prolongs post-partum amenorrhea, through the working of the prolactine hormone which plays a role in the production of mother's milk, and thus delays conception in the absence of contraceptive measures. At a population level therefore, prolonged breastfeeding will increase the length of birth intervals (Knodel and Kintner 1977). It therefore also follows that if the infant dies and lactation is broken off, fecundity is quickly resumed so that, if no other means of birth regulation is being applied, a new conception and a new birth will happen earlier than when the infant stays alive and breastfeeding continues as normal. This biological principle can be used to determine indirectly the likelihood that mothers were breastfeeding their babies for a considerable length of time. In this indirect method the length of birth intervals is determined by the survival status of the previous child; if the previous child dies, the 'waiting time' for a new birth will be much shorter than when the previous child survives its first year of life, again provided no other means of birth regulation is applied. Louis Henry, one of the founding fathers of historical demography, has established that in a population which did not practise fertility control the average difference between 'normal' birth intervals, where the previous child survived infancy, and intervals where the previous child died in infancy, could be as much as nine months (Knodel and Van de Walle 1967).

Below we first examine the length of birth intervals by religious group irrespective of whether the previous infant died; following that we present the length of birth intervals by survival status of the previous child. Figure 3 shows the length of all birth intervals taken together following the birth of the first child for three groups: Catholics, Dutch-Reformed (*Nederlands Hervormden*) and all other religious denominations. This latter category comprises a miscellaneous group of Calvinists (*Gereformeerden*), Anabaptists (*Doopsgezinden*), Jews and non-believers. Each of these subgroups is fairly small. Table 3 may be consulted for precise figures behind the graph. The graph effectively shows the 'waiting time' for mothers for another birth to occur since the birth of the previous child. Thus, if the curve drops sharply to about mid-level (0.50) by 24 months after the start of the interval, this indicates that half of all women have already had another child two years after the birth of the previous child. The proportion of women who have not had another birth two to three years after the arrival of the previous child may be regarded as the proportion of women who are 'spacing' births, i.e. increasing the length of the birth interval in order to delay child bearing. Furthermore, the graph shows that all curves begin to flatten out after about five to seven years; these plateaus indicate the proportion of women who after the previous birth have not given birth again. These figures indicate the proportion of women in a population who are regarded as 'stoppers': women who, for whatever reason, are not likely to conceive and give birth again.

It is clear that there are large differences between the three denominational groups. For Catholics the curve descends quickly in a steep slope which indicates that some women already had another baby only one year after the birth of the previous child. Two years after the arrival of the previous child only 51 percent of Catholic women did not yet have another child. This is in stark contrast with Dutch-Reformed women and above all with women in the 'other' religious group; in both categories women were experiencing much longer waiting times before another birth occurred. What do the graph and the corresponding table tell us regarding the issue of breastfeeding? The large proportion of Catholic women who already had another child within two years is indicative, no more than that, of low levels of breastfeeding but also of the relative absence of any strategies to prevent another conception. The graph thus also provides a good indication of the differences in fertility levels between the three denominational groups, and the likelihood to which spacing and stopping occurred in each group. The results for the other denominational groups indicate that more women in these groups were postponing (spacing) the birth of another child, either through the effect of breastfeeding or the application of fertility control measures, or by a combination of strategies. Moreover, the graph also indicates that Catholic women were less inclined to stop child bearing altogether when compared to the women in the two other denominational groups. This can be deduced from the fact that the plateau at which the curve for Catholics levels off, lies well below the other curves.

Figure 3: Proportion of Mothers who have not had a Birth since Last Birth, by Religion

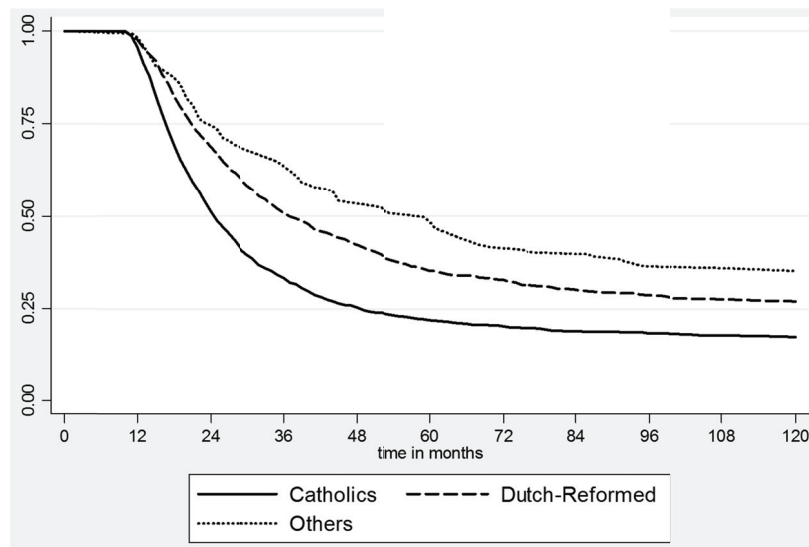


Table 1: Proportion of Women who have not yet had a Birth since Last Birth, by Religion

Cohort of Mothers Born 1881-1885			
	Catholics	Dutch-Ref.	Others
after 2 years	51.1	68.6	74.6
after 5 years	21.9	35.3	48.5
after 7 years	18.9	30.1	40.3

As stated above, this is no more than a first indication. A further test for the likelihood that women were breastfeeding their babies can be found in a comparison of the waiting time until the next birth by the survival status of the previous child. Birth intervals will be considerably shorter in those cases where the previous child did not survive infancy and its mother was breastfeeding, given the absence of contraception, when compared to ‘normal’ intervals where the previous infant did survive its first year of life (Knodel and Van de Walle 1967). We will compare these two types of intervals for the two major denominational groups, the Catholics and the Dutch-Reformed; results are presented in the graphs in figures 4 and 5. For the group adhering to ‘other’ religions numbers were too small for a meaningful analysis, i.e. there were only few cases where the previous infant died. This latter finding fits in with the results found above: the group of women in the category of ‘other’ religions was characterised by long birth intervals and relatively low fertility levels. Under those circumstances infant death rates will also be low.

Figure 4: Proportion of Mothers who have not had a Birth by Previous Child Status, Catholics

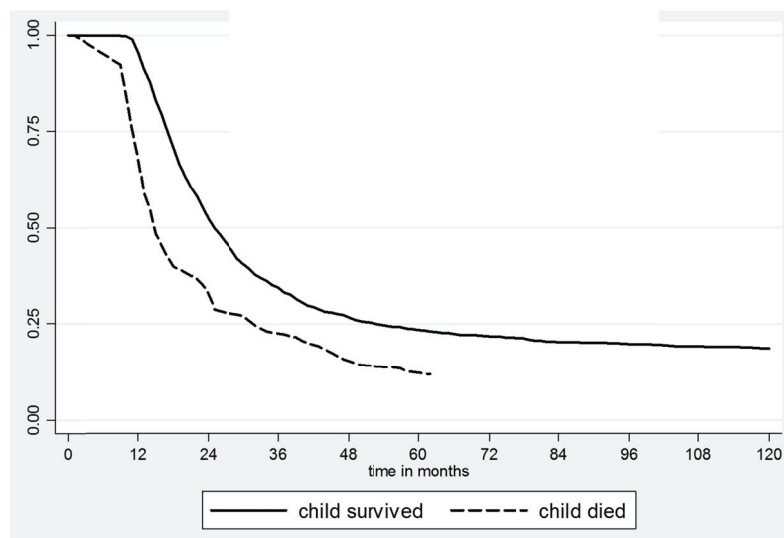
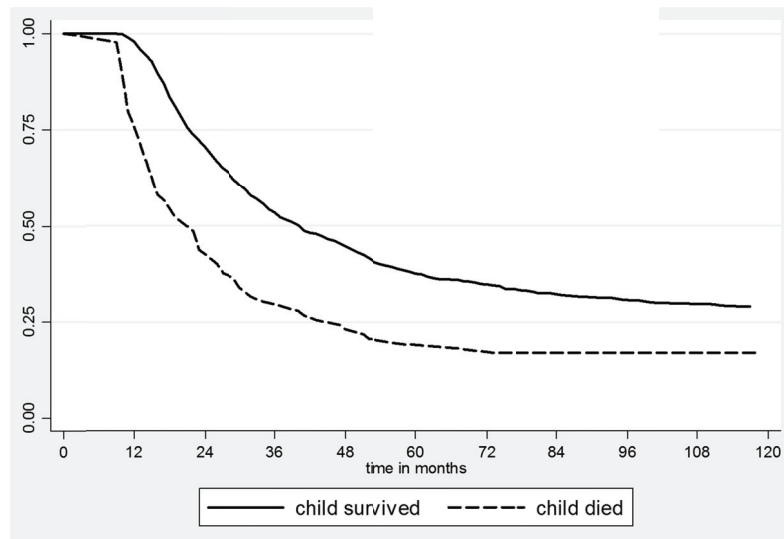


Figure 5: Proportion of Mothers who have not had a Birth by Previous Child Status, Dutch-Reformed



By examining figures 4 and 5 a number of differences stand out. It is clear that for Catholics both survival curves drop steeply during the first two years, but also that both curves are relatively close together. This combination of results indicates two things. First of all, regardless of the survival status of the previous child, the next birth arrives quite soon, so most Catholic women were not in any way attempting to postpone another birth through birth regulation. Secondly, most Catholic women were also not breastfeeding, because breastfeeding would increase the differences between the two curves. Figure 5 shows that the results for the Dutch-Reformed are rather different. In this group the curve for 'child survived' moves at a much higher level than was the case for Catholic women, it drops much less steeply than the corresponding curve for Catholics. However, when the previous infant dies, Dutch-Reformed women experience another birth much more quickly: we see this curve declining more sharply during the first two years, thereby resulting in a larger differential between the two survival curves for Dutch-Reformed women than for Catholic women. However, the shape of the curve for 'previous child died' for Dutch-Reformed women is different from the corresponding curve for Catholics: it declines less sharply so that two years after the previous birth of the infant who has died, more Dutch-Reformed have not yet given birth again when compared to Catholic women who were in that same situation. These results lead to the following conclusions. First of all, the majority of Catholic women were not breastfeeding their infants, neither were they applying other contraceptive

measures. For Dutch-Reformed women on the other hand, it is clear that more of them were breastfeeding, as the difference between the two survival statuses was considerable. Moreover, Dutch-Reformed women were also more likely to revert to various other types of birth regulation, given the much higher levels at which the two curves were moving at all.

Having explored the differences in birth intervals between the two major denominational groups, we also have to consider the question to what extent regional differences are ‘hiding’ behind the religious differentials. Catholics may not have been a solid group, as a number of historians on Dutch Catholicism have argued in recent years (Luykx 2000; Hülsken 2010). Moreover, there is an important strand in Dutch historiography which emphasizes the importance of region over religion as a determining factor of mortality patterns. This tradition dates back to the sociologist Hofstee who assumed that people in the western and coastal provinces of the country were more open to modern ideas about hygiene and disease prevention so that public health could improve faster there than elsewhere. This greater receptiveness to modern ideas and attitudes in the western provinces had nothing to do with religion, according to Hofstee, but sprang from the social and economic structure of these regions (Hofstee 1958). The coastal provinces were more urbanised, already since the 17th century, and were more oriented towards trade which brought them into frequent contact with foreigners as well as with new ideas. The inland provinces, by contrast, were more dominated by agriculture, the area was less urbanised, and in-migration played a minor role in these provinces. Hence, there was less influx of new ideas and attitudes, but also the receptiveness towards new ideas lagged behind. We may therefore assume that Rotterdam Catholics may have been more inclined to adopt more modern baby care practices than Catholics in Enschede or Tilburg. Especially for Catholics in the southern town of Tilburg, pressures to conform to traditional caring practices may have been difficult to escape, given that the level of in-migration in this town was extremely low (Janssens 1993).

Table 2 therefore looks at the in-between-town differences in birth intervals for the two major denominational groups, again distinguished by the survival status of the previous child. There are large differences between the towns, for both religious groups; and there still are large differences between the two religious groups within one and the same town. Compared to the Catholics, fewer Dutch-Reformed women already had a next child two years after the previous birth, and in each town this applied to both types of interval. This is indicative of both breastfeeding – because of the differential by survival status of the previous child – and other contraceptive measures being applied in this group by a considerable proportion of women. However, between the towns important differences existed. For the Catholics, a clear division appears between the north-west and south-east, although the differences between Rotterdam and Enschede are only small for those cases where the previous infant

survived. Catholic women in the north-west were therefore more likely than Catholic women elsewhere to be breastfeeding their infants and also applying other fertility restricting strategies. Furthermore, the results for Catholics in Enschede are remarkable: here overall spacing is considerable, comparatively speaking, but the large differential between the two types of intervals indicates that the higher level of spacing is brought about by breastfeeding. In Tilburg birth intervals were extremely short, even if the previous child survived; this indicates that fewer Catholic women in this town were breastfeeding their babies. The figures for Catholics in Zaandam are difficult to interpret because of the small number of Catholics here, and the absence of intervals in which the previous child has died; but it is clear that Zaandam Catholic women were much more restrictive in fertility behaviour than Catholics in the other three towns. For the Dutch-Reformed regional differences also seem to have been important; it should however be stressed that the number of cases for this religious group in Tilburg was extremely low so caution is warranted. However, it is clear that the Dutch-Reformed in Enschede were participating in what may perhaps have been a regional culture of breastfeeding practices. The Dutch-Reformed in this town had a high differential between the two types of curves, but overall the intervals were moving at higher levels, so additional measures were taken to prevent another birth. It is also worth noticing that the Dutch-Reformed in Enschede for intervals where the previous child lived, had higher proportions of women who had not yet had a birth as compared to Rotterdam. Dutch-Reformed women in Rotterdam also had intervals which were rather close together, which indicates that Dutch-Reformed women in Rotterdam were not as much inclined to breastfeed. Their higher levels of spacing resulted from some women in this group applying other means of fertility restriction.

Table 2: Proportion of Women who have not yet had a Birth Two Years after the Last Birth, by Survival Status of Previous Child and by Town, for Catholics and Dutch-Reformed

Cohort of Mothers born 1881-1885				
	Catholics		Dutch-Reformed	
	Child Survived	Child Died	Child Survived	Child Died
Enschede	55	24	79	36
Tilburg	49	33	100	50
Rotterdam	58	45	60	56
Zaandam	67	-	71	44

Table 2 thus underlines the importance of regional cultures of breastfeeding practices in addition to religiously determined cultures of baby care. In the following part of the paper we will proceed to conduct a multi-variate event history analysis of infant mortality to determine to what extent the religious and regional differences we have seen above, played an important role in the explanation of infant mortality patterns.

5. Multivariate Event History Analysis of Infant Mortality

The results discussed below have been derived from a discrete-time event history analysis using logistic regression models. To conduct this analysis, we constructed a so-called ‘person-period-file’ in which for each live-born child a record was included for each month the child survived during its first year of life, starting with the first month of life up to the month of dying or the last month of the period under study, whichever comes first. For each month a child survived, the dependent variable (dying) takes value 0; if the child died in a given month, the child’s final record is added, with the dependent variable having value 1. The database thus constructed contains the month-history of all 2682 live-born children of the 656 mothers in the sample.

For each successive month of age, the event history analysis estimates the dying hazard, i.e., the probability of dying for those children who were still alive at the start of the month. In addition to month of age, and the two crucial variables under examination here, religion and location (town), we have various other types of child data, e.g. information about the parental family, such as the father’s occupation, and information about birth intervals, parental death, and other types of family data. This means that we effectively have sets of siblings, so that we are able to see some of the interactions between the individual child and the institutional level of the family. However, this also means that our observations, individual children’s months, cannot be assumed to be independent, after all the sets of siblings have a shared background in their parental family. To account for unobserved heterogeneity between families or mothers, a random mother-effect was included in the regression models. The resulting mixed models were estimated with the ‘xtlogit’ procedure of the statistical package Stata, version 10.

The analysis proceeds in five steps, resulting in five different regression models. There are two basic models (model 1 and model 3), one examining the effect of religion on the hazard of dying, the other examining the regional effect, that is the effect of town of residence. Each of these two basic models is then enriched with other explanatory and control variables to study possible changes to the effects of either religion or region. In this way we can trace whether effects of religion or region or due to the confounding effects of other factors. These results are presented in model 2 and model 4 respectively. The final model number 5 includes all covariates, for both religion and region, and all other controlling covariates. One covariate is however included in all of the models: the covariate labelled ‘month’ indicating the time that elapses since birth. Obviously, the hazard of dying, irrespective of other influences, is greatest immediately after birth, but even after the first six months the hazard may decrease with each month that is added to the life course.

The effect of religion is measured by a set of dummies for Catholics, Dutch-Reformed and the other religious denominations. As has been explained above,

Catholics and Dutch-Reformed were the two major religious denominations in the Netherlands, and we are primarily interested in the differences between these two groups. The category ‘other religions’ contains only few cases and comprises a small number of infants from Calvinists (*Gereformeerden*), Anabaptists (*Doopsgezinden*) and Jewish origins. The dummies indicating the family’s religion use the Dutch-Reformed as the reference category. For the differences between regions or towns three dummies are used for Tilburg, Rotterdam and Zaandam which are contrasted with the reference category Enschede.

After that we have included a set of dummies indicating the social class of the index child’s father. To avoid small numbers of observations we have collapsed some occupational categories: upper class occupations are taken together with middle class ones, and farmers are included with the skilled workers in the category farming/skilled. The unskilled workers are used here as the reference category. Concerning the father’s occupation we expect that higher occupational strata have lower mortality risks than those at the bottom of the scale, although the effects of social class are not always found in mortality studies on pre-twentieth century societies.

In addition, we include a number of important biological and demographic control variables: the sex of the child, the age of the mother at the time of the birth of the child, the birth rank of the index child, whether or not the index child was the first child born to that mother or part of a twin, and the duration of the birth interval immediately preceding the birth of the index child. The dummy variable ‘female’ is especially important for infant mortality as boys are expected to have higher mortality risks in the first few months of life, probably due to higher genetic frailty. The age of the mother plays a role as children born to very young or very old mothers tend to have lower survival chances, certainly during the first few months of their life. The child’s birth rank within the family can have considerable effect on his or her survival chances. It is likely that first-born children were better taken care of, as competition for mother’s time and resources was absent and that with increasing birth rank the mother’s health was being depleted. This latter fact is important when considering infant mortality. Moreover, it also has the advantage that it includes the effects of higher fertility levels which are rather different between the towns and between the religious groups. Short birth intervals could have disastrous effects, especially for infants. If the preceding interval was only short, the mother’s biological resources may not have been fully replenished yet for the new birth. However, the interval variable is also of interest here because of its connection to breastfeeding: this variable could be regarded as a proxy for breastfeeding. The shorter the interval, the more likely that the mother is not habitually suckling her children during their first year of life. We also checked whether a following baby was born before either the death of the index child

during infancy or before the end of its first year of life. That was not the case, however, so this variable could not be tested.

In addition, we have added variables indicating other deaths in the family. We first have two time-varying variables indicating whether the child's mother or father died. Further time-varying variables indicate whether the previous child died, as well as the total number of previous children that have died. It is evident that the death of one of the parents could have strong negative effects on the survival chances of infants and young children. However, the effects might be very different depending on which parent died (Derosas and Oris 2002). When mothers died prematurely, there might be a strong negative effect for infants who were no longer breastfed. In addition, without older daughters it might be difficult to keep the household going. When fathers died, it was likely that the main source of family income would be removed. And in both cases the family might fall apart and become divided over various other relatives such as uncles and aunts. The variable indicating the death of the sibling born immediately previously to the index child is constructed as a simple dichotomous but time-varying variable which is switched on when that previous child dies. The variable labelled 'Nr. previous children dead' indicates whether or not the index child had siblings who died before reaching age five, either during the life of the index child or before its birth. This time-varying variable is constructed as a count variable indicating the number of children in the family that have died below age five. It is obvious that the death of previously born siblings removes some of the competition for family resources, which effect may improve the infant's survival chances. On the other hand, previous sibling deaths may also indicate the existence of a tendency within the family for 'death clustering'. This term refers to the finding that infant deaths in many populations are not distributed randomly between families but tend to concentrate in some families (Edvinsson and Janssens 2012). This effect then would impact negatively on the infant's survival.

6. Results

Table 3 presents the outcomes of the regression analyses for the risk of dying for the first year of life for all 2682 children. The table gives the estimated b-coefficients and indications for level of statistical significance. Negative values for the b-coefficients indicate reduced mortality risks and positive b values indicate increased risks. As to the b values it therefore follows, perhaps a little counter-intuitively, that variables which have positive health effects, and thus reduced mortality risks, will have negative b coefficients. For the various dummy variables (religion, town, sex, social status) the results should always be interpreted in contrast to the reference category. For instance, the results for 'Catholic' and 'other religions' indicates whether Catholic infants and infants

with ‘other religions’ have higher or lower mortality risks compared to infants in Dutch-Reformed families. Likewise, the sex of the child (‘female’) indicates whether female children have an increased or decreased risk to die as compared to male children. Finally, for continuous covariates such as the age of the mother at the birth of the index child, the interpretation refers to a one unit increase: each time the age increases by one month, the hazard of dying becomes smaller.

Table 3: Logistic Regression Models for the Monthly Risk of Dying during Infancy

	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	-5.132***	-3.033***	-4.718***	-2.415***	-2.395***
Month	-0.11***	-0.11***	-0.11***	-0.11***	-0.11***
Dutch-Reformed (ref)	-	-			-
Catholic	0.55**	0.49**			-0.01
Other religions	-0.18	0.02			0.42
Enschede (ref)			-	-	-
Tilburg			0.35'	0.23	0.24
Rotterdam			-0.20	-0.37	-0.38'
Zaandam			-1.20***	-1.23***	-1.27***
Male (ref)		-		-	-
Female		0.01		0.01	0.02
Father upper-middle class		-0.36		-0.21	-0.23
Father farmer-skilled labour		-0.10		-0.04	-0.05
Father unskilled labour (ref)		-		-	-
Age mother at birth child		-0.06**		-0.07**	-0.07**
Birth rank child		0.13'		0.16*	0.15*
First born		-0.55*		-0.51'	-0.52'
Twin child		1.14***		1.06***	1.06***
Length previous birth interval		-0.02*		-0.01*	-0.01*
Previous infant dies		-0.22		-0.23	-0.24
Nr. previous children dead		-0.01		-0.04	-0.03
Mother dies		2.30**		2.14**	2.14**
Father dies		0.88		1.11	1.12
N = months of observation	30613	30613	30613	30613	30613
Number of children	2682	2682	2682	2682	2682
Number of mothers	656	656	656	656	656
Variance between mothers	0.825	0.463	0.720	0.424	0.404
-2 log likelihood	2585	2532	2565	2511	2510

Significance levels: *** < 0.001; ** < 0.01; * < 0.05; ' p < 0.10

Let us begin by taking a look at the results for the two basic models; model 1 may be termed the ‘restricted religion model’ whereas model 3 may be called the ‘restricted region model’. Model 1 indicates that infants in Catholic families had highly increased mortality risks as compared to infants in Dutch-Reformed families; this effect is strong and highly significant. There are no differences though between the ‘other religions’ category and the Dutch-Reformed. Inter-

estingly enough, model 3 shows that there are also strong regional differences. Children born in Zaandam have strongly and highly significantly reduced risks to die during their first year compared to children born in Enschede. This effect, it should be noted, is stronger and more significant than the effects found for the religion variable. By contrast, infants in Tilburg families have higher mortality risks than those in Enschede families, but this result is weakly significant at the 10% level. Both restricted models also contain the covariate 'month' which, as expected, indicates that for infants the first few months of life were highly dangerous, but with every month added to the infant's life the risk of dying decreases considerably and this effect is highly significant. The effect of this covariate stays the same throughout all of the models presented here.

Models 2 and 4 show respectively the 'extended religion model' and the 'extended region model'. Let us focus on the most important result first. The addition of the social status dummies, the dummy for the sex of the child, and the various biological and demographic variables does not alter much in the outcomes for either the religion or location variables. Catholic infants are still running higher risks than Dutch-Reformed infants; and infants in Zaandam are still much better off with much higher survival prospects than infants in Enschede. The only shift in the location results concerns the effect of the dummy for Tilburg: in model 4 as compared to model 3 the covariate for this town no longer has any statistical significance. It therefore follows that the primary difference is between Zaandam and the other three towns.

The other covariates in the extended models behave more or less as we would expect; moreover, what is important to underline is that the results on those additional covariates do not vary between the two extended models. Let us discuss the additional covariates one by one. In most populations male infants seem to be running higher mortality risks, mostly soon after birth, because of higher genetic frailty; here we do not find any result on the hazard of dying for the dummy 'female' child. The covariates for the social status of the index child's father do also not yield significant results: infants born to upper- and middle class fathers were not running a lower level of mortality risk. This conforms to other research which has recently cast doubt on the relevance of social class and occupational factors for infant mortality, or for mortality in other age categories (Bengtsson and Poppel 2011). In addition it fits results found in an earlier study on infant mortality in Tilburg; in that study social class also appeared irrelevant for the survival status of infants (Heijden 1995).

Demographic and biological factors are much more important, the major one being, not surprisingly, the mother's death which affected the infant's survival chances very seriously and very negatively. A second major threat to infant survival comes from being part of a twin birth, which result is again hardly surprising. Other important influences are the age of the mother at the time of the birth of the index child, and the child's birth rank. Having an older mother

was beneficial for the child, perhaps because older mothers were more experienced in child care. Birth rank works in the opposite direction: first-born children had better survival prospects whilst children of higher birth ranks were evidently facing significantly higher mortality risks. This is evidence of the depletion of maternal resources, both biological and social – but unrelated to age –, with the increasing numbers of pregnancies, births and the rising size of the family. Furthermore, the length of the previous birth interval is a relevant factor, as we would expect. Short intervals did not allow the mother to recuperate sufficiently from the previous birth, causing serious damage to the index child's health. The death of earlier born siblings, or the previously born sibling, did not result in a significant effect on the child's mortality hazard. It is of interest to note that the coefficients for these two covariates have a negative sign, which points to the tendency that a decrease in the size of the sibling set involves a relaxation in the competition for scarce family resources, with a potential improvement of the infant's health status.

Before we shift our attention towards a discussion of the final model, it is useful to briefly highlight the comparative statistical fit of the models reviewed so far, as expressed by the -2 log likelihood which is presented at the bottom of table 3. This measure indicates the degree to which one model, as opposed to another one, provides a better fit with the observations in the data set, whereby a lower figure implies a better fit. In the case at hand here the comparisons should be between model 1 and 3, and between model 2 and 4. We can see that the two 'region models', model 3 and 4, have a much better fit than the two 'religion models', models 1 and 2 respectively. From this it follows that the region dummies are better predictors for infant mortality than the religion dummies.

We then arrive at a discussion of the final model which combines religion and region while controlling for all relevant causal and confounding factors available in the dataset. In this final model the impact of religion is completely wiped out whilst all other factors, which were discussed above, retain their level and direction of impact as well as their significance. This final model makes clear that the importance of religion as an exogenous determinant for infant mortality is completely superseded by the regional factor. This is in stark contrast to the fact that the outcomes for region, the coefficients for the three towns, if anything, have only gained in importance by the addition of the religion dummies. Model 5 shows that there is a clear opposition, already visible in the previous regional models, between the north-west and the south-eastern parts of the country. In particular Zaandam stands out with strongly and significantly reduced risks for infant mortality as compared to the other towns; but also Rotterdam does a better job at infant survival than both Tilburg and Enschede. Between Tilburg and Enschede though, significant differences cannot be found. The final model therefore provides very strong evidence for the argumentation that Catholics and Dutch-Reformed *per se* did not differ in terms

of the survival rates of their infants in the early decades of the 1900s. Nevertheless, before we close this issue, let us briefly consider the possibility that model 5 may be masking important differences between the two religious groups *within* one of the four towns. To test for this possibility further models were run which included interaction terms for all possible combinations of towns and religious denominations. These interaction terms were added to the full model displayed in model 5.⁶ It appeared that none of the interaction terms came up with significant results; apparently within one and the same town there were no significant differences in infant mortality risks between Catholics and Dutch-Reformed. We may therefore safely conclude that it was regions which were determining the fate of the little ones, not religion.

7. Conclusions

In this paper we have examined the influence of religious cultures on infant survival in the Netherlands in the first few decades of the twentieth century, more specifically the influence of the Catholic religious culture on infant mortality. In much of the historiography as well as in the writing by contemporaries Dutch Catholics in the period between 1880-1920 are portrayed either as having been averse to the introduction of modern medicine and hygiene, or as followers of a strict clerical campaign of prudishness enforcing the binding of female breasts and prohibiting the bearing of breasts in public. As a result, the argument goes, Catholic mothers did not or could not suckle their infants, thereby creating life threatening situations for their infants given the poor hygienic circumstances of that time. We first explored the likelihood that Catholic mothers were not breastfeeding their infants by examining the duration of birth intervals for different religious denominations. We looked at the overall duration of birth intervals, and we scrutinised the differences in birth intervals by the survival status of the previous child, which provides an indirect method to gauge the level of breastfeeding. The results suggest that a lower proportion of Catholic women were breastfeeding in the early decades of the twentieth century when compared to the Dutch-Reformed. However, it also appeared that there were important differences between Catholics from different towns. For instance, Catholics in the east of the country were as much as the Dutch-Reformed in that same town participating in what seems to have been a strong local culture of breastfeeding. In addition, no uniform pattern could be found for the Dutch-Reformed.

⁶ The tables containing the results for these interaction models are not presented in this paper but they are available upon request from the authors.

In the final part of the paper we tested the role of religion as the most important exogenous determinant *per se* of infant mortality in the period 1880-1920 through a multi-variate and multi-level analysis taking into account all relevant factors. In this way we could control for a host of social, demographic and biological influences on the risk for infants to die during their first year of life. For instance, fertility was much higher in Catholic families than in Dutch-Reformed families (Janssens forthcoming). As children from higher birth orders always have an increased mortality risk, these fertility differences are bound to create a strong confounding influence on infants' mortality hazards. Also other family factors were found to be important for infant survival: the mother's death clearly presents an enormous threat to infant health, and being part of a twin definitely poses hugely increased mortality risks. Social status based on occupational titles, however, is irrelevant for infant survival; therefore, the assumption that the higher Catholic death tolls can be attributed to group characteristics such as level of income or social status does not seem very likely. When controlling for various social, demographic and biological influences, the impact of religion is still considerable. However, when town of birth and residence is added to the equation, religion is reduced to insignificance. Infant mortality was strongly determined by local cultures, and quite likely by local circumstances; and these local cultures impacted strongly upon the life chances of infants.

We have concluded above that it was regions which were determining the fate of infants, not religion. How should we interpret these results? Let us first underline the fact that these outcomes fit results produced by Walhout (2010) very well. As we discussed above, Walhout concluded that Dutch-Reformed mothers in the Catholic province of North-Brabant – in this province the town of Tilburg was also situated – were as much inclined to cease breastfeeding as Catholic mothers, or maybe even more so. The interaction models which we tested, showed that the Dutch-Reformed in Tilburg tended towards higher mortality hazards compared to the Catholics in the same town. Although this result was not significant, it still contributes to the strong image of regional differentials in mortality which has emerged from our results. It can be assumed that local ecological and medical circumstances are, maybe partly, responsible for the pattern found. The degree to which families at that time had access to decent systems of water supply and waste disposal may have differed by town; although, as was reported above, an earlier study on Tilburg has cast doubt on the importance of water supply for infant mortality. Also, the availability of medical facilities, the number of local physicians for instance, may have differed. Nevertheless, it is also likely that families were influenced by regional cultures of baby care, that mothers communicated, even across the strict religious lines of those days, about the way they were treating their infants. This strong regional factor can also be found in the fertility patterns of the families researched here, the results of which are reported elsewhere

(Janssens forthcoming). In fertility patterns regions appeared as a strong influence, even gaining in explanatory power in later decades, but next to the religious factor which remained very important. However, for infants to survive the first year of life, regions were more important than religion.

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